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THE USE OF PRICE INDEXES IN ESTIMATING CURRENT COST



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THE USE OF
PRICE INDEXES
IN ESTIMATING
CURRENT COST

The Accounting Standards Committee of the Canadian Institute of Chartered Accountants (CICA) issued new accounting standards on Reporting the Effects of Changing Prices effective for fiscal years beginning on or after January 1, 1983 and applying to large Canadian public corporations.

The standards recommend disclosure of the impact of inflation and specific price changes on the operations and financial performance of these major corporations.

In determining the specific price changes for capital items such as plant and equipment, some companies may want to use the price indexes developed by Statistics Canada.

Following is a reprint of text on the use of price indexes in estimating current cost prepared by the Prices Division of Statistics Canada.

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PRICE INDEXES FOR CURRENT COST ACCOUNTING

Current cost reporting requires disclosure of specific price changes. The CICA accounting standards on **Reporting the Effects of Changing Prices** suggest the use of general price indexes to estimate the impact of inflation on some financial statement items. Specific price indexes may also be useful in estimating the current cost of some elements of capital expenditure.

This guide is provided by the Prices Division of Statistics Canada to assist accountants in finding and using price indexes in preparing current cost financial statements. The information provided here is mainly directed towards the problems of selecting price indexes for estimating the current cost of capital items.

The limitations

It should be understood that there are basic incompatibilities between what the accountant requires for estimating current cost and what a price index measures.

The accountant needs to estimate the current costs of replacing a service where the new item or good providing the service might be quite different from that which gave rise to the historical cost. Price indexes estimate the cost of reproducing the original or an equivalent good. When today's good is different from its base period equivalent, the index maker attempts to factor out the cost of the difference in making an estimate of the price change. However, when goods are substantially different in characteristic, the only practical course may be to assume that the price movement of the new goods (not in the price sample) is that of goods already included in the price sample. In other words, goods falling outside the price sample are assumed to have the price movement of goods for which prices are collected. Those using indexes should be aware that the actual price movement of such goods may not, in fact, follow the movement of goods for which price measurements have been made. The classic example of such a good which has thus far defeated price change measurement is the computer and its assorted peripherals and software.

Consequently, price indexes can be used most accurately to update historical cost for closely related goods. An historical cost updated with such a price index provides an estimate of the reproduction cost for the good involved. If you know there is a wide divergence between the cost of replacing an item and the cost of reproducing it (which becomes more likely the older the historical cost), the current cost should be estimated directly.

It should also be kept in mind that price indexes are developed from price samples associated with nation-wide expenditure patterns which will probably not relate directly to the particular circumstances of one company. For example, those whose share of the market has changed sharply in the recent past or who have plant transfer prices or prices subject to escalation or long term contract arrangements will need to verify that their price behaviour matches the national average price change for commonly sold goods.

Mindful of these conditions, price indexes can be used effectively in estimating the current cost of capital expenditures--updating historical costs to today's price levels--whenever today's goods are similar to the goods produced in an earlier period. Such an updated cost comes close to estimating the reproduction cost of a good: what it would cost today to rebuild the plant or equipment.

The major uses

The question is simple: How many of today's dollars are required to replace selected goods and capital expenditures?

In some instances, the answer is also simple . . . as may be the case in estimating the current cost of inventory when goods are produced continuously and where the company has available records of both the cost of goods produced and of goods sold. Purchase records may similarly answer the question in the case of goods purchased in volume.

This guide focuses on the problems of estimating the current cost of diversified capital goods, which are not usually purchased in volume year after year. For these goods, price indexes have a particular contribution to make in estimating current cost and can be used, for example:

- to obtain current cost estimates for plant and equipment purchased in the near past
- to update a recently prepared valuation or appraisal
- to derive interim estimates of current cost while waiting for more authoritative estimates to be developed internally or for externally prepared valuation studies
- to crosscheck the soundness of current cost information derived from other sources or by other techniques; for example, company data, where purchases are somewhat discontinuous or where the goods are variable
- to extend the usefulness of company-produced data. Where such data is fragmentary, it may be improved through combination with official price indexes
- to obtain timely estimates of price change through entering monthly price indexes into a company's extrapolation or forecasting models.

IMPORTANT CHARACTERISTICS OF PRICE INDEXES

In using a price index, it is important to know its purpose, the nature of the price components and how these components are weighted.

The purpose of the index

Each series has a stated purpose, which delineates what is excluded from a survey as well as defining what is included, information vital to the index user. The purpose is set out briefly in the technical references appended to current publications and, in more detail, in reference papers published from time to time. For example:

- an industry selling price index provides an estimate of price change for goods sold by Canadian manufacturers to both domestic and external purchasers
- the Consumer Price Index provides an estimate of the change in the cost of a constant basket of goods and services purchased by urban Canadian consumers.

The main components of price indexes

Prices

Collection: Prices are sought principally for market transactions of commonly traded goods involved in the stated purpose of the index. Hence manufacturers' selling prices are collected from manufacturing establishments which usually report their factory gate shipment price. One way of judging the precision of an index is to determine the mis-match between the required sources of the prices and the sources used by the index maker. For example, price changes for a Prices Paid by non-residential contractors index could be accurately measured by collecting prices from a mixture of wholesalers, jobbers and manufacturers. The prices actually used for estimating price change for materials used by non-residential contractors are manufacturers' selling prices. As a consequence, price change arising from changes in transportation rates, wholesalers' margins and some taxes are omitted from the published indexes.

Price relatives: The price relative is the ratio resulting from the division of a current price by its base price. Price relatives are usually proportionately weighted within an index in order to represent the relative importance of reporting establishments, as occurs in calculating a commodity index for the manufacturers' selling prices series.

Pricing points: A pricing point marks the point at which goods change hands. They are part of the specifications followed when price information is collected. In judging the quality of a given index for your use, it is important to note whether the pricing points used in the index are consistent with its stated purpose.

For example, manufacturing selling prices are systematically collected at the factory gate, a point consistent in providing estimates of price change for goods sold by Canadian manufacturers. However, particularly with plant indexes or indexes for capital expenditures, pricing points are often some distance from the ideal. For example, the owner of machine tools requires a purchase price index for machine tools. For a number of reasons, the only series which have been constructed relate to the sales--not the purchase prices--of manufacturers of machine tools either in Canada (which Statistics Canada collects) or in the United States (lent in the form of a published series from the US Bureau of Labour Statistics). As a result, price change for transportation and distributors' margins are omitted. This could be an important omission for someone whose plant location is far from main sources of supply. (The method used to adjust US series for foreign exchange assumes that there is no foreign exchange absorption by distributors.)

The consequence of these practices is that movement of purchase prices is assumed to be the same as adjusted selling prices, an assumption which can be reasonable for, say, machine tools delivered to a factory in central Canada, with its short transportation distances, but requires more examination and verification for, say, civil works in northern Alberta.

Within the construction components of plant indexes, it is sometimes necessary to use price indexes for certain elements of materials or labour which are even further removed from the appropriate pricing point. When data of this type are encountered, a company may want to use its own cost data for such goods as, for example, concrete-in-place and earth works in place, data which could include contractor's cost charges and profit margins.

Weighting patterns and formulas

An index formula describes how the weighting pattern and the price series are combined.

The weights given to various components in an index express their relative importance within the index. For example, an analysis of 1978 buying patterns indicated that 21 percent of consumer spending was allocated to food; so food has a 21 percent weight in the Consumer Price Index.

The most commonly encountered weighting systems are:

Base-weighted (also known as "Laspeyres"): If the survey period for the weighting pattern is the same as the time reference year for an index, the index is described as base-weighted. Such an index provides an estimate of what the base year basket of goods would cost if purchased in this or any other year. Price comparisons between intervening periods can be made.

Fixed-weighted: As above except that the survey period for the quantity weights is different from the time reference year. In the case of the CPI, for example, the survey period for the weights is 1978. The time reference period is 1981. So quantities in accordance with 1978 buying patterns are valued in 1981 prices.

As with the base weighted index, comparisons between intervening periods can be made.

Current-weighted (also known as "Paasche"): This index uses the buying patterns of the current year as weights, thereby providing an estimate of what this year's purchases would have cost in the base period, not in any other intervening year. (Between other years there can be shifts in quantities as well as changes in price; so comparisons of price changes between intervening periods should be made with caution.)

Implicit price index: An implicit price index is a variant of a current-weighted index, and is called "implicit" simply because it is arrived at through calculations of value series rather than through the direct development of current period price samples weighted with current weights. In implicit index construction the values of current quantities, expressed in the price levels of the base period, are calculated in as much detail as possible, usually by deflating the current values with a closely related price index. The resulting "constant dollar values" are summed and divided into the sum of the originally reported current values. The ratio that results is referred to as an implicit price index.

Implicit price indexes can be calculated wherever matching current and constant dollar values are available. Within the data provided for Gross National Expenditure, a series of implicit price indexes is presented, at the total as well as for a number of the components. The total Index is cited by the CICA standards on Reporting the Effects of Changing Prices as an index providing a general estimate of inflation. Implicit Price Indexes for Business Gross Fixed Capital Formation are listed in the bibliography (Appendix A) at the end of this booklet.

As with current weighted indexes, comparisons between a given year and the base year will be accurate, but comparisons between the given year and any other year should be treated with caution because of the effect of quantity changes. The mathematical formulas for Laspeyres and Paasche and implicit indexes are presented in Appendix B for those who want details on the calculations.

Most Statistics Canada price indexes are prepared from formulas which approximate these models--although no directly calculated Paasche price indexes are provided. In the formulas, weights and content within the finest level of index components will vary through time, because of births and deaths of reporting establishments and through substitutions of one volume seller for another. In base or fixed-weighted indexes, weights applied to broader commodity groups will hold constant--usually for a period of 4 or 5 years or more.

USING STATISTICS CANADA DATA

Frequency of publication

Various indexes are published annually, quarterly or monthly. Appendix A, the Bibliography, includes the frequency of publication of the indexes most commonly used in estimating current costs.

Does Statistics Canada provide detailed technical descriptions about index construction?

Brief technical notes accompany each publication of recent data. Reference documents containing more comprehensive information are also usually released with major revision. These papers are listed in the Bibliography in Appendix A.

The agency tries to provide clear descriptions of its methods in order to enable users to form their own opinions about the quality of the data.

Where possible, statistical or other judgmental measures of data quality are provided. To ensure understanding about the information being collected, the Bureau works closely with those businesses reporting prices. Results are analyzed to see that they make sense. Where the agency makes use of administrative records from businesses, purchasers or business associations, the relationships are described.

The revision policy for each series is described in the relevant publications, and any deviations from described practice, or errors in tabulation, are announced.

How to get Statistics Canada information

Indexes are published regularly and are available from Statistics Canada in a number of forms (Appendix A).

The development of new information is announced in summary form in the Bureau's subscription publication, the Daily Bulletin.

Simultaneously, full detail becomes available through CANSIM, Statistics Canada's computerized data bank and its supporting software. After that, the Prices Division and the Bureau's regional advisers are able to provide information by phone or telex. Some weeks later the hard copy publications become available. Most industrial price indexes are listed in CANSIM.

Listed in Appendix C are the phone numbers and addresses of local and national sources of information.

Can Statistics Canada help users obtain indexes from foreign statistical agencies?

The Statistics Canada library has extensive collections of statistics from other countries, and their publications are accessible to users. Appropriate phone numbers are provided in the Source of Information Appendix D. Also included is a short list of names and addresses of other statistical agencies.

CHARACTERISTICS OF PRICE INDEXES OF PARTICULAR CONCERN IN CURRENT COST ACCOUNTING

Following are some common questions about the use of price indexes in assessing the impact of general inflation and for estimating the current cost of capital goods.

Q. How do I deal with the fact that some data are released far too late for use in preparing my company's financial statements . . . and, in any case, data are often revised?

A. The Consumer Price Index is available monthly about two weeks after the relevant month and it is not subject to revision. Most other indexes are subject to revisions, usually over varying periods of up to a year. In addition, the timing of data release is often later than required to prepare year end financial reports when companies are using quarterly or annual capital expenditures price indexes. Because of this, users may have to estimate the missing series to meet their own tabulation requirements.

The missing months or quarters of the year can be estimated by one of a number of techniques, some of which may already be developed for use in company forecasting models. Most often monthly series are incorporated in such models. Two of the most frequently used are Input Price Indexes into Non-residential Construction which include both materials and wage rates and the Industry Selling Prices Indexes. These are listed in sections 2.1 and 4.2 in the Bibliography, Appendix A.

Technical specialists preparing the forecasts should keep in mind that monthly series are given equal weight in base or fixed weighted index calculations.

The implications of revisions to most recently published data should be placed in perspective. Most revisions are in the less than 1 percent range--an error of estimate likely to be much smaller than that associated with other estimates required for current cost.

Q. I need to restate the original cost of a 30 year old factory. Are price indexes available that far back?

A. While most closely related price indexes do not have that kind of history, it is possible to make use of the most appropriate substitute series to estimate backward the price movement of the series you need.

If, for example, the factory is in Toronto, Statistics Canada publishes a light industrial building index for Toronto beginning in 1972. (Light industrial building indexes are also available for Montreal, Ottawa and Vancouver and are being developed for Calgary and Halifax.) This series excludes land, but includes estimates of contractors' labour and material costs, overheads and profits. As such it answers quite accurately the question: How much would a contractor charge me today to rebuild this structure?

To estimate price change between 1952 and 1972, you can borrow the price movement of the most appropriate index with a longer history and use its rate of change to estimate backwards the movement of the index you are interested in. The available indexes are:

- 1) The Capital Stock indexes for buildings. These extend back to the late 1800s. See 3.2.4 in the Bibliography, Appendix A.
- 2) The input price indexes for non-residential construction which extend back to about 1925. See item 4.2 in the Bibliography. From 1925 forward, the components of this series were the main price information used in the capital stock series cited above. (Price movement for the earlier period of the Capital Stock series was estimated in 1960 from limited data from the period 1880 to 1925.)
- 3) The Implicit Price Index for Non-Residential Construction. See 3.2.1 in the Bibliography. In the period 1926 to about 1960, the deflation of these series was calculated mainly from wage rates or average hourly earnings data and the price of construction materials. To these input series was added a productivity adjustment for construction labour which served to lower the movement of the index.

In summary, despite some differences, the series described in 1 and 2 are generally similar. The movement of the implicit price index would also be similar for 1926 to 1970 except for the inclusion of the productivity adjustment.

An indexed estimate of current cost for a 30 year old building should not be taken as complete in itself. Even if the Toronto light industrial building index were available for 30 years, the answer you would get through indexation should be regarded as an approximation. It is an approximation of the reproduction cost. If you need the replacement cost, confirmation is required that it would be similar to the reproduction cost estimate.

Q. How can foreign price indexes be converted to Canadian ones?

A. Statistics Canada develops indexes of exchange rates and indexes of duty rates. In the absence of directly collected prices, such indexes are used to adjust the movement of foreign commodity indexes. The resulting adjusted indexes are included in most of the plant and all of the machinery and equipment price indexes, by industry of purchase. See section 3.3 and 3.4 of the Bibliography. (To derive the adjusted price movement, the commodity index is multiplied by the exchange rate index and that result is multiplied by the duty rate index.) Daily exchange rates are taken from the Bank of Canada through CANSIM.

Appendix D lists some sources of statistics from other countries.

There are also privately produced indexes available in the US and other countries which may be reliable estimates of price changes in particular areas. A Canadian company's engineering department may well have some of this material on hand. Companies should, however, record their own experience in duty rates and federal and provincial sales taxes. Statistics Canada is willing to share its limited information on duty rates.

Q. What do I do if the weighting in the Statistics Canada index does not meet my needs?

A. You may want to create a special index combining the official component price indexes with the weights experienced by your particular company, substituting company weights for national weights.

For example, in the first quarter of 1983, the index level for Chemical and Mineral Process Plant stood at 284.3. One component, the fabricated equipment index, which had a weight of 14 percent, stood at 364.9. Suppose that your plant has 30 percent of the cost associated with fabricated equipment. In the presence of both sharp divergences in price movement and differences in plant weighting patterns, it may be preferable to combine the company weights with the official price indexes to create your own special index. While the tabulation exercise involved is not difficult, this kind of customized treatment should be restricted to important classes of capital expenditure. The procedure is demonstrated in Appendix E.

It should be noted, however, that the reweighting is tied to the amount of detail provided in the published indexes. (As a result it is necessary to accept the weighting system within any commodity series.)

If the subdivisions within a plant index cause difficulties because they do not follow a standard engineering or technical breakdown, Statistics Canada would like to be advised about the deficiencies of its classification system.

Q. What about finding the replacement cost rather than the reproduction cost?

A. Price indexes are estimates of price change net of costs for changes in quality or quantity. The indexes do not attempt to estimate the costs associated with replacement of service, just reproduction cost--the cost to build the same historical good again. Therefore the indexes can be most reliably used only as long as it is believed that the reproduction cost and the replacement cost of the good are similar. As soon as the two diverge, replacement cost must be estimated by whatever means are appropriate for the class of capital concerned. Having established a new level of cost for a class of capital, a price index can be used again to update the new estimate of replacement cost.

In these circumstances, it is clear that one of the first steps in estimating current cost is to review capital expenditures, their age or average age, and to identify those elements of plant which are being replaced with plant of substantially different character.

To assist this review, a sample table is provided in Appendix F. This table lists the important characteristics of capital spending to consider in estimating current costs:

- detailed classes of capital expenditures, in rank order of relative importance
- age or average age of goods in the class
- availability of company purchase or cost data
- price indexes selected as relevant
- company cost data selected as relevant
- review cycle--the required frequency of review
- the kind of review required.

- (a) The most important classes of capital expenditures should be identified, with greater attention paid to the quality of estimate for the high value components.
- (b) The age of the plant or equipment is also important. Forecasts of average life and the probable cost of replacement are usually subject to less error when goods have a relatively short life. With a short life, there is also increased likelihood that purchase prices are available.

As a plant ages, it becomes increasingly likely that estimates of replacement cost and reproduction cost are beginning to diverge.

For important classes of plant, it is prudent to introduce some cycle of review which can either confirm the validity of indexed historical cost or provide a new estimate of replacement cost. Indexing can subsequently be used to update the new replacement cost.

- (c) In an ideal situation, a company should be able to estimate replacement cost from its own records of construction activity and purchases. Section V of the Appendix table provides a format that can be used to list those components of capital which can be restated by company data.
- (d) The most suitable indexes should probably be assigned for all classes of plant, either to serve as the source of updates while company data are being developed, to crosscheck company estimates, or to update engineering or appraisal estimates.
- (e) Section VII is provided as a sample format for recording the frequency of review. The aim might be to review every class of plant once every three or four years. The review would include judging index suitability, and establishing the likely characteristics of replacement goods.
- (f) For any important classes of capital where it is believed that replacement and reproduction cost are significantly different, decisions may need to be made on how to estimate replacement cost--for example, through appraisals, or engineering studies done in-house or by consultants. Because of the cost of such studies, contract letting procedures and company information systems should be reviewed to ensure that all useful purchase price and cost estimating data are sought and captured systematically. This may, for example, prompt more uniformity in contract letting practices to ensure comparability of data across contracts or across projects.

Such information, collected in a table, aids in identifying areas on which to concentrate. A similar table prepared annually can also record how current cost was calculated for each code of accounts.

Q. What index does Statistics Canada have for land?

A. Statistics Canada publishes only one series for land. It relates to serviced lots sold by housebuilders together with the house itself. The value of the lot is an estimate provided by the builder who reports selling prices for houses sold to consumers--a transaction which usually includes land. Such estimates are particularly difficult to make where serviced lots are not sold in any volume. See item 3.1.1 in the Bibliography.

Q. If you want to use particular indexes, how do you find out about the amount of component detail available?

A. The best way is to ask for a printout from CANSIM, the computerized data base which gives all the component series of a given index. Or you can consult the publications listed in the appended Bibliography.

In general, most indexes contain considerable component detail which will be of particular interest to users who wish to substitute their own weighting patterns for the national weights. Such users may also wish to exclude components which are not relevant to their activities, particularly where the price movements for those components differ sharply from other indexes of the series.

Q. The CICA standards on current cost reporting recommend the use of either the Consumer Price Index or the Gross National Expenditure Implicit Price Deflator to show the impact of inflation on some financial statement items. How does the Consumer Price Index (CPI) differ from the Gross National Expenditure Implicit Price Index (GNEIPI)?

A. The CPI and the Implicit Price Index for the Personal Expenditure component of Gross National Expenditure resemble one another both in terms of coverage and movement. However, the CPI target group for whom price changes are being measured is urban dwellers and the index is fixed-weighted, while the GNEIPI price change relates to all consumers and the values used in the calculations provide current-weights. In addition, housing and some other components are treated differently in the CPI than they are in the Personal Expenditures on Consumer Goods & Services series used in the GNEIPI.

More importantly, the Gross National Expenditures series contains a number of additional major components:

- gross additions to capital for both business and governments, as well as government current expenditures
- the value of inventory changes is included
- the value of exports is included
- the value of imports is deducted.

As a consequence, the total implicit price index that results from dividing the current by the constant dollar totals of Gross National Expenditure is derived from a broader range of transactions than the CPI.

The GNEIPI series is published quarterly, rather than monthly like the CPI, and it is subject to revisions extending back about four years.

Q. Are indexes relevant to the mining, oil and gas industries available from Statistics Canada?

A. Indexes for all classes of plant of the mining, oil and gas industries are not available through Statistics Canada. Some relevant component data are available through Statistics Canada.

Relevant series, using the numbering system used in the Bibliography, Appendix A, are:

Chemical & Mineral Process Plant Indexes (3.4.1)

The weighting system for this index was derived from capital expenditures of construction and installed machinery and equipment reported by important establishments classified to the following major Groups of the Standard Industrial Classification (1970).

Division 4	Mines, Quarries & Oilwells
Division 5	Major Group 17 - Non-metallic Mineral Products
Division 5	Major Group 18 - Petroleum and Coal Products
Division 5	Major Group 19 - Chemical and Chemical Products

Lack of data, with particularly poor coverage from Division 4, prevents the preparation of separate major group indexes.

The series is derived from estimates of price change for literally hundreds of domestic and imported elements of machinery and equipment used in the construction of process plant for the major groups and divisions listed above. In addition, estimates of price change for installations and overheads are included, most of which are derived from wage rate information. Estimates of price change for office buildings are also included.

Statistics Canada derives the published Chemical and the Petrochemical Plant Indexes (3.4.1) by retabulating the series cited above, with weights representative of major groups 18 and 19 only. Some additions are made to the price samples, mainly for stainless steel elements. Some commodities inappropriate to the more restricted definition of plant are excluded.

The machinery and equipment components of these series have also been separately aggregated to provide the following detail within the Machinery & Equipment Indexes (3.3.2) in the Bibliography) listed below:

Division 4*	Mines, Quarries and Oil Wells
Division 5	Major Group 10* - Paper & Allied Industries
Division 5	Major Group 17 - Non-metallic mineral products
Division 5	Major Group 19 - Chemical and Chemical Products

The asterisked series also have available what is called a 'special use' index which encompasses all of the equipment unique to that grouping. Also provided are a number of common use indexes for such things as cars, trucks, and office furniture. U.S. Bureau of Labour Statistics producer price indexes are used in these indexes to represent price movement for imported goods, adjusted for changes in Exchange & Duty. Federal sales tax adjustments are made as necessary for all series. These indexes are rated to give an indication of the strength of their weighting system and price samples.

Statistics Canada would welcome suggestions as to how these series could be strengthened. In addition, the Bureau will provide technical support to industry groups wishing to produce such price indexes.

APPENDIXES

Appendix A

Statistics Canada - Industrial Prices
Ottawa

BIBLIOGRAPHY OF OFFICIAL PRICE INDEXES FOR THE RESTATEMENT OF VALUES OF INVENTORIES AND CAPITAL EXPENDITURES

Section A: List of publications which contain current information

1.0 General Prices Indexes

2.0 Price Indexes for the Restatement of Inventories

3.0 Price Indexes for the Restating Capital Expenditures

3.1 Residential Construction

3.2 Non-residential Construction

3.3 Machinery and Equipment

3.4 Engineering and Plant Construction Price Indexes

4.0 Miscellaneous Price Indexes

Section B: Associated Reference Documents

Section C: Sources of Additional Help

February, 1983

Statistics Canada - Industrial Prices
Ottawa

BIBLIOGRAPHY OF OFFICIAL PRICE INDEXES FOR THE STATEMENT OF VALUES OF INVENTORIES AND CAPITAL EXPENDITURES

Section A: List of publications which contain current information

	<u>Catalogue Number(3)</u>	<u>Publication Title(3)</u>	<u>Periodicity of Data</u>	<u>Comments</u>
1.0 General Price Indexes				
1.1 Implicit Price Indexes, Total and components for Gross Additions to Capital(2)	13-001	National Income and Expenditures Accounts	Quarterly	These Current Weighted Implicit Price indexes are subject to revision for the most recent four years. The Component indexes for capital expenditures are listed below.
1.2 Consumer Price Indexes	62-001 62-010	The Consumer Price Index Consumer Prices and Price Indexes	Monthly Quarterly	For Canada and 15 regional cities. Selected commodity prices and price indexes within cities are provided in addition to the total. More detailed monthly statistics are available in 62-010. The weighting system presently in use reflects 1978 consumer expenditure patterns restated into 1981 price levels.

- (1) All the series listed in this bibliography may be retrieved from CANSIM, the Statistics Canada machine-readable data base.
 - (2) In some instances, more detail is provided in CANSIM than is retained in the publication cited.
 - (3) See reference document listed in Section B of this table.
- (3) Publication Title and Catalogue Numbers are as published in February 1983.

<u>Catalogue Number</u>	<u>Publication Title</u>	<u>Periodicity of Data</u>	<u>Comments</u>
2.0	Price Indexes for the Restatement of Inventories		
2.1	Industry Selling Price Indexes: 62-011 Manufacturing (ISPI)(2)	Monthly	More than 600 commodity indexes for materials, machinery and equipment are provided as well as over 100 industry indexes. These indexes are undergoing revision from a 1971 to 1981 time base. The orientation of new series will be towards commodity indexes and away from industry aggregations of commodities.
2.2	Consumer Price Indexes (CPI)(2) 62-010	Monthly	Selected commodity indexes for food, housing, clothing, transportation, health, and personal care, recreation, reading and education, tobacco and alcohol are provided for 15 cities.
2.3	Purchase Price Indexes of Industrial Materials (Secondary Metal Scrap and Thermal Coal) 62-011	Monthly	Purchase price indexes are provided for ferrous and non-ferrous metal scrap for thermal coal, and for inputs into steel foundries.
2.4	Farm Input Price Indexes (FIPI) 62-004	Quarterly	Indexes for eastern and western Canada are provided for such commodity groups as machinery, seed, and fertilizers. Some provincial series are available on CANSIM.
2.5	Raw Materials Price Index 62-011	Monthly	Price indexes for domestically produced and imported unprocessed materials. A total index and selected major group indexes are published.

	<u>Catalogue Number</u>	<u>Publication Title</u>	<u>Periodicity of Data</u>	<u>Comments</u>
3.0 Price Indexes for Restating Capital Expenditures				
3.1 Residential Construction Price Indexes				
3.1.1 New Housing Price Indexes, by city	62-007	Construction Price Statistics Monthly	Monthly	Large and medium residential general contractors' selling price indexes for new housing for about 20 cities. Estimated price movement is also given separately for the structure and for serviced land. Single detached, semi- detached and row housing are priced but not published separately.
3.1.2 Residential Construction Implicit Price Index(2)	13-001	National Income and Expenditure Accounts	Quarterly	Implicit price index for all residential construction ex- land (singles, rows, condominiums, apartment buildings of all sizes and types are included as well as conversions and capitalized repairs). Real estate commissions are also included as well as mobile homes and cottages.

<u>Catalogue Number</u>	<u>Publication Title</u>	<u>Periodicity of Data</u>	<u>Comments</u>
3.2 Non-residential Construction Price Indexes			
3.2.1 Implicit Price Index for Non-residential	National Income and Expenditure Accounts	Quarterly	Current-weighted price index of all classes of non-residential and engineering construction with land excluded. Prices for labour and materials used for many components.
3.2.2 Output Price Index of Non-residential Construction (Selected Buildings), by city(2)	Construction Price Statistics	Quarterly	Contractors' selling price for Montreal, Toronto, Ottawa and Vancouver aggregated to give for each city base-weighted indexes for a light industrial building, an office building and a school. A tabulation for a hospital is available on request from the Prices Division.
3.2.3 Farm Input Price Indexes Building and Fencing	Farm Input Price Indexes	Quarterly	Input price indexes for labour and materials for Eastern and Western Canada and Total. See also Manufacturers of Prefabricated Buildings, 08 2543 in 2.1 on page 2 of the Bibliography.
3.2.4 Price Indexes for Capital Expenditure on Plant and Building Construction	Fixed Capital Flows and Stocks, 1926-1978, Occasional Fixed Capital Flows and Stocks	Annual Annual	Mainly fixed-weighted input price indexes, organized by industry of purchase. Annual data is available from the Construction Division. Catalogue 13-211 is published annually while 13-568 is published occasionally and generally contains more historical detail. These data are primarily of interest for the period prior to 1965.

3.3	Machinery and Equipment Price Indexes	Catalogue Number	Publication Title	Periodicity of Data	Comments
3.3.1	Implicit Price Index for Machinery and Equipment(2)	13-001	National Income and Expenditure Accounts	Quarterly	Current-weighted price index for all classes of business purchase of machinery and equipment.
3.3.2	Machinery and Equipment Price Indexes, by Industry of Purchase(2)	62-007	Construction and Price Statistics	Quarterly	Indexes are provided covering machinery and equipment purchased by Canadian Industries. Indexes by source - domestic, imported and total - are published quarterly for 43 industries together with 22 total-level commodity series from 1971 forward. Domestic indexes are adjusted for changes in federal sales taxes and indexes for imported goods are adjusted for exchange, duty, and federal sales taxes. Weights are derived from the Input/Output Table at the L level. Prices are mainly Canadian or Bureau of Labour Statistics manufacturers selling price indexes adjusted as described above.

3.3.3 Price Indexes for Capital Expenditures	Catalogue Number	Publication Title	Periodicity of Data	Comments
	13-568 or 13-211	Fixed Capital Flows and Stocks Fixed Capital Flows and Stocks Annual	Annual	<p>Base-weighted price indexes are available at a total level only by industry from 1955 and for 4 major groups from 1896 to 1955:</p> <ul style="list-style-type: none"> - printing, publishing and allied industries - iron and steel products - transportation equipment - other <p>13-568 provides full detail and is published occasionally. Annual updates are contained in 13-211 or are available from the Construction Division. When individual commodity indexes are required see also 3.3.3, 3.3.4, 3.4.1 and 3.4.2. These indexes are of most use for the period preceeding 1971.</p> <p>(1) See reference document listed in Section B of this table.</p>
3.3.4 Industry Selling Price Indexes for specific machines or equipment	62-011	Industry Price Indexes	Monthly	<p>Extensive detail provided for Industry Selling Price Indexes for domestic production of machinery and equipment. See also detail provided within series cited in 3.3.3, 3.3.4, 3.4.1 and 3.4.2.</p>

3.4	Engineering and Plant Construction Price Indexes	Catalogue Number	Publication Title	Periodicity of Data	Comments
3.4.1	Chemical and Mineral Process Plant Price Indexes; Chemical and Petrochemical Plant Price Indexes.	62-007	Construction Price Statistics	Quarterly	An index is provided with some commodity detail for all major types of chemical and mineral processing plants with a further separate tabulation for a more restrictive class of chemical and petrochemical plant. Data is adjusted as relevant for exchange rates and federal sales tax.
3.4.2	Electric Utility Construction Price Indexes	62-007	Construction Price Statistics	Annual	<p>Separate indexes are provided for five major classes of expenditure at the national level.</p> <ul style="list-style-type: none"> - distribution systems - transmission lines - transformer stations - hydro electric generating stations - steam electric generating stations (fossil fuel) <p>Prices relate to construction goods in place where possible and make use of inputs into construction elsewhere. Extensive commodity detail is available from CANSIM or on request from Prices Division. Data is adjusted as relevant for duty, exchange and federal sales tax. Indexes include capitalized overhead and interest during construction. Indexes are available which exclude interest during construction.</p>

3.4.3	Highway Construction Price Indexes	Catalogue Number	Publication Title	Periodicity of Data	Comments
		62-007	Construction Price Statistics	Annual	Indexes are calculated from the data provided by provinces for contractors' selling prices for grading, granular base courses and paving, and for materials which the highway departments supply the contractors. Detail is available on request from Prices Division and from CANSIM. In later years the prices collected have exhibited more variability in price levels than is desirable for accurate estimates of price change.

3.4.4	Canadian Telecommunications Plant Price Index	62-007	Construction Price Statistics	Annual	An aggregation of price indexes prepared by major telecommunications companies under the direction of Statistics Canada. Prices are manufacturers, selling prices for installations of major elements of equipment, companies' purchase price data and labour rates associated with own account construction. Weights were derived from companies gross additions to capital for the period 1974 to 1976.
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	<u>Catalogue Number</u>	<u>Publication Title</u>	<u>Periodicity of Data</u>	<u>Comments</u>
3.4.5	13-568	Price Index for Capital Expenditure on Plant and Equipment by Industry -- Engineering Construction	Fixed Capital Flows and Stocks Annual	For chemical and mineral processing plant, users should refer also to 3.4.1 above. For highways 3.4.3. For electric utilities see 3.4.2 above. For all other engineering construction a separate index is provided for railway construction from 1871 and for all other industries from 1872. 13-568 provides full detail and is published occasionally. Annual updates are contained in 13-211 or are available from the Construction Division. These indexes are of interest primarily for the period before 1961.

Catalogue Number	Publication Title	Periodicity of Data	Comments
4.0	Miscellaneous Price Indexes		
4.1	Field-installed materials	Quarterly or semi- annually	Indexes are provided for several varieties of fabricated steel in place and for pre-cast concrete in place. See also component indexes of 3.2.3.
4.2	Inputs into construction price indexes for building materials and wage rates	Monthly	Input indexes are provided separately for residential and non-residential building construction. Some commodity detail is provided as are wage rate indexes by region. More extensive commodity indexes are available from the source listed in 2.1. Also provided in 62-007 are trade and city indexes for construction wage rates. Full details of this extensive system are available from CANSIM or from the Prices Division. These series may be particularly useful to incorporate in company forecasting models.
4.3	Selected Financial Indexes	Monthly	Indexes are given for prime business loans, for mortgages, for bond yield averages and for the US exchange rates. Other financial indicators are available from CANSIM which are not reprinted in 62-007.

Section B: Associated Reference Documents(1)

<u>Catalogue Number</u>	<u>Publication Title</u>
13-549 E	System of National Accounts, National Income and Expenditure Accounts. Volume III.
62-553	The Consumer Price Index Reference Paper, Concepts and Procedures, Updating based on 1978 Expenditures.
62-543	Industry Selling Price Indexes: Manufacturing. 1971=100, 1956-1976.
62-552	Machinery and Equipment Price Indexes, by Industry of Purchase. 1971=100, 1971-1979.

- (1) Reference documents cited in this section related to major data systems, are of recent origin and are in good supply. Users requiring additional technical information should contact Statistics Canada.

Section C: Sources of Additional Help

Publications

Government publications may be purchased from local authorized agents and other community bookstores or by mail order.

Mail orders should be sent to Publication Sales and Services, Statistics Canada, Ottawa K1A 0V7, or to Publishing Centre, Supply and Services Canada, Ottawa K1A 0S9.

Inquiries

Goods and Services Producing Industries Section, Prices Division: telephone 613-995-5764

Capital Expenditures Prices Section, Prices Division: telephone 613-996-3744

APPENDIX B

INDEX FORMULAS

Laspeyres Price Index

The base-weighted price index expresses the current cost of a specified basket of goods as a percentage of the cost of the same basket in a base period. Algebraically this can be stated:

$$I_n = \frac{\sum p_n q_o}{\sum p_o q_o} \times 100 \quad \text{which may be transformed into the more convenient form}$$

$$I_n = \sum \frac{p_n}{p_o} \left\{ \frac{p_o q_o}{\sum p_o q_o} \times 100 \right\} \text{ where}$$

I_n = index for year n

Σ = summation over all items

p_n = price of an item in year n

p_o = price of an item in year o

q_o = quantity of the item in the weight-base period

$\frac{p_n}{p_o}$ = price in year n as a ratio of price in year o

$p_o q_o$ = value (cost) of a given item in the weight-base period

$\frac{p_o q_o}{\sum p_o q_o} \times 100$ = relative weight of a given item in the base period

Paasche Price Index

Paasche price indexes express the cost of a current year's basket of goods at current year prices as a percentage of the cost of the same basket of goods at base-year prices. The weights change each year. This is in contrast to the Laspeyres index in which weights are constant from year to year and are derived from the base period. The formula is:

$$I_n = \sum \frac{p_n}{p_o} \left\{ \frac{p_o q_n}{\sum p_o q_n} \times 100 \right\} \text{ where}$$

I_n = index for year n

Σ = summation over all items

p = price of an item

q = quantity of an item

o, n = subscripts designating base year o and current year n

$\frac{p_n}{p_o}$ = price in year n as a ratio of the price in year o

$\frac{p_o q_n}{\sum p_o q_n}$ = the cost of a given item in the current year divided by the cost of all items in the current year, current quantities being valued at base year prices

The main use of a current weighted price index is to remove the element of price change from an aggregate value series so that in the deflated series quantities are valued in terms of the prices of the base period and the deflated series measures changes in volume only. To perform these calculations, the index and the value series must be closely matched to one another.

The deflation process may be illustrated as follows:

$$\frac{V_n}{I_n} = \frac{\sum p_n q_n}{\sum p_o q_n} = \sum p_o q_n$$

where

V_n = current aggregate value of total expenditures

I_n = current-weighted index

Σ = summation over all items

p = price

q = quantity

o, n = subscripts designating base year o and current year n

In simpler terms, the constant dollar value is obtained by dividing the annual expenditure for a given item by its price relative series:

$$= p_o q_n = \frac{p_n q_n}{\frac{p_n}{p_o}}$$

The series of constant dollar values derived by this process may be converted easily to index form by expressing each year's value as a percentage of the base year value. The resulting index is a base-weighted volume index which measures pure volume change in expenditure from year to year.

Where a current-weighted index is available (which happens rarely), deflation can take place at a total level. A simulation of a current-weighted index can be prepared by dividing base-weighted price indexes at a fine level of detail into their matching value series. These constant dollars are summed and divided into the sum of the matching current dollar value series. The resulting ratio, with its current period weights, is defined as an implicit price index to distinguish the series from a directly derived current-weighted price index. Algebraically an implicit price index is:

$$\frac{\sum p_n q_n}{\sum p_o q_n}$$

Most Statistics Canada price indexes are either base weighted (Industry Selling Price Indexes, Bibliography 2.1) or fixed weighted (Consumer Price Index, Bibliography 1.2). No Paasche price index is listed in the Bibliography. Implicit price indexes, resulting from Gross National Expenditure calculations in current and constant dollars or as part of the Capital Stock calculations are listed in the Bibliography (items 1.1, 3.1.2, 3.2.1, 3.3.1).

Generally, commodity detail is provided only with base or fixed weighted indexes. Users should also note the time reference period—soon to be 1981 for most indexes and presently 1971 = 100 for most series. Any series to an earlier time reference period should be given careful inspection to ensure that the old weighting system and the price samples are still appropriate.

APPENDIX C

Advisory Services

Statistics Canada is able to help you identify, obtain and use statistics. Regional Advisory Services have reference centres in nine cities across the country where users are welcome to telephone or drop in, use the study areas, arrange to buy one or more publications or obtain statistics from CANSIM, the Bureau's computerized data bank.

St. John's, Newfoundland

3rd floor, Viking Bldg
Crosbie Road
A1B 3P2

Local call: 772-4073
Toll free no: Zenith 07037

Montreal, Quebec

10th floor, Alexis Nihon Plaza
1500 Atwater Avenue
H3Z 1Y2

Local call: 283-5742
Toll free no: 1-800-361-2831

Winnipeg, Manitoba

6th floor, General Post Office Bldg
266 Graham Avenue
R3C 0K4

Local call: 949-3257
Toll free no: 1-800-282-8006

Edmonton, Alberta

2nd floor
11010 - 101 Street
T5H 4C5

Local call: 420-3027
Toll free no: Alberta
1-800-222-6400
NWT Zenith 2-2015

Halifax, Nova Scotia

3rd floor, Sir John Thompson Bldg
1256 Barrington Street
B3J 1Y6

Local call: 426-5331
Toll free no: 1-800-565-7192

Toronto, Ontario

10th floor, Arthur Meighen Bldg
25 St. Clair Avenue East
M4T 1M4

Local call: 966-6574
Toll free no: 1-800-268-1151

Regina, Saskatchewan

5th floor
530 Midtown Centre
S4P 2B6

Local call: 359-5405
Toll free no: 1(112)800-667-3524

Vancouver, British Columbia

Main floor
1145 Robson Street
V6E 3W8

Local call: 666-3594
Toll free no: B.C. south & central
112-800-663-1551
B.C. north & Yukon
Zenith 08913

Ottawa Central
Lobby, R.H. Coats Bldg
Ottawa, Ontario
K1A 0T6

Local call: 996-5254

APPENDIX D
SOME SOURCES OF STATISTICS FROM OTHER COUNTRIES

UNITED STATES

Producers' prices and price indexes

Monthly

Includes commodity indexes appropriate for the restatement of inventories or components of capital expenditures such as transformers or trucks.

Source: United States. Bureau of Labor Statistics
Department of Labor
Washington, D.C. 20212

Distribution: Superintendent of Documents
United States Government Printing Office
Washington, D.C. 20402

Electric utility construction

Semi-annual

Includes cost indexes for field construction work appropriate for hydro-electric generating stations, transmission lines and transformer stations.

Source: United States. Bureau of Reclamation
Office of Design and Construction
Bldg 27
Box 25007
Denver Federal Center
Denver, Colorado 80225

Price trends for federal-aid highway construction

Quarterly data published semi-annually

Source: United States. Dept. of Transportation
Federal Highway Administration
Office of Engineering
400 Seventh St. S.W.
Washington, D.C. 20590

Sewage treatment plant

Quarterly

Includes a construction cost index for waste water treatment plant, sewer system including treatment plant of several qualities covering 20 cities.

Source: United States. Health and Human Services
Division of Water Supply and Pollution Control
Washington, D.C. 20201

Survey of current business

Monthly

Re-publishes those privately produced price indexes which are used in the preparation of the U.S. estimates of constant dollar gross national expenditure. The same indexes are also re-published in the McGraw Hill publication Engineering News-Record.

Source: United States. Department of Commerce
Bureau of Economic Analysis

Distribution: Superintendent of Documents
United States Government Printing Office
Washington, D.C. 20402

UNITED KINGDOM

Current cost accounting guide: guide to prices indexes for overseas countries, 1977.
36 p.

Source: United Kingdom. Central Statistical Office

Distribution: Her Majesty's Stationery Office
P.O. Box 569
London SE1 9NH

The business monitor. Miscellaneous Series. MM17-Price Index Numbers for Cost Accounting. (monthly supplement).

Includes commodity indexes and weighting patterns as well as industry indexes.

Source: United Kingdom. Department of Industry

Distribution: Her Majesty's Stationery Office
P.O. Box 569
London SE1 9NH

WEST GERMANY

Preise. Reihe 2. Preise and preisendizes fur gewerbliche produkte (erzeugerpreise).

Annual

Includes producers price indexes for materials, machinery and equipment.

Source: Statistisches Bundesamt, Stuttgart

Distribution: W. Kohlhammer
Postfach 42-1120
65 Mainz 42
Federal Republic of Germany

Reihe 3. Index der grundstoffpreise.

Annual

Includes price indexes for raw materials.

Source: Statistisches Bundesamt, Stuttgart

Distribution: W. Kohlhammer
Postfach 42-1120
65 Mainz 42
Federal Republic of Germany

Preise. Reihe 4. Messzahlen fur bauleistungspreise and preisindizes fur Bauwerke.

Includes contractors' selling prices aggregated into selected building configurations.

Source: Statistisches Bundesamt, Stuttgart

Distribution: W. Kohlhammer
Postfach 42-1120
65 Mainz 42
Federal Republic of Germany

JAPAN

Economics statistics monthly.

Monthly

Distribution: Bank of Japan
Statistics Dept.
Foreign Statistics Section
CPO Box 203
Tokyo 100-91
Japan

Price index annual.

Annual

Contains wholesale price indexes, export-import prices indexes and input-output price indexes of manufacturing industry. By Sector.

Distribution: Bank of Japan
Statistics Dept.
Foreign Statistics Section
CPO Box 203
Tokyo 100-91
Japan

OTHER

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT

Main economic indicators.

Monthly

Distribution: Organization for Economic Cooperation and Development
Division of Economic Statistics and National Accounts
2, rue Andre-Pascal
Paris, 75775 CEDEX 16
France

UNITED NATIONS

Monthly bulletin of statistics.

Monthly

Source: Dept. of International Economic and Social Affairs
United Nations.

Distribution: Unipup
345 Par, Ave. S.
New York. N.Y. 10010
U.S.A.

APPENDIX E

How to Make Your Own Index

Statistics Canada and Company K

<u>Statistics Canada</u>	<u>Statistics Canada</u>	<u>Company K Copper Expenditures for Current Year Expressed In 1971 Prices(6)</u>
Copper and Copper Alloy Rolling, Casting and Extruding Index(1)	Adjusted Weights in 1971 Prices	
Copper, unalloyed, pipe and tubing(2)	71.2	30
Copper, unalloyed, plates, sheets strip and flat products(3)	10.7	
Copper, alloyed, pipe and tubing(4)	3.5	70
Copper, alloyed, plates, sheets, strip and flat products(5)	14.6	

(1) Index No. 12 2970

(2) Index No. 12 2970 008

(3) Index No. 12 2970 009

(4) Index No. 12 2970 015

(5) Index No. 12 2970 016

(6) Current year expenses are divided by the appropriate price index to express the expenditure in 1971 price levels. This step permits reaggregation in a compatible fashion with the official indexes, most of which are on a 1971=100 time reference base.

Reweighting a Series

Reweighting a series is an easy procedure as demonstrated in the following example. The company expenditure pattern taken from Table 1 has been used to weight the two most closely related indexes, indexes 2 and 4, from that table. Table 2 shows 279.7 as the 1980 February company index level, calculated by reweighting the published indexes using the following equation:

$$\frac{(30.0 \times 270.3) + (70.0 \times 283.7)}{100} = 279.9$$

Table 2 Published and Company-Derived Copper Indexes

Index Reference Period		Copper, Unalloyed, Pipe and Tubing	Copper, Alloyed, Pipe and Index	Company- Derived Copper
Tubing				
1980	February	270.3	283.7	279.7
	May	203.4	227.2	220.1
	August	211.8	231.7	225.7
	November	206.6	228.0	221.6
1981	February	198.6	225.5	217.4
	May	200.0	232.3	222.6
	August	208.6	245.6	234.5
	November	202.8	231.8	223.1
1982	February	198.2	229.8	220.3
	May	200.1	229.4	220.6
Weights(1982 quantities, 1971 prices)		30.0	70.0	100.0

In this instance the company index provides estimates of price changes for an appropriate list of commodities weighted together as reflects company expenditures. In this example the results are quite different as can be seen in Table 3.

Table 3 Company-Derived Copper Indexes and Aggregated Metal Indexes

Index Reference Period		Company- Derived Copper Index (12 2970)	Industry Index
1980	February	279.7	278.4
	May	220.1	209.0
	August	225.7	214.2
	November	221.6	213.7
1981	February	217.4	203.6
	May	222.6	206.4
	August	234.5	215.4
	November	223.1	204.2
1982	February	220.3	198.5
	May	220.6	199.3

Appendix F

Defining the Characteristics of Company Gross Additions to Capital

I	II	III	IV	V			VI		VII	VIII
Classes of Capital Expenditures, in Order of importance	Gross or Net Additions Remaining	% of Total	Estimate of II older than 10 years	Company Data which can be used to estimate replacement cost			Price Indexes Selected to estimate reproduction cost		Periodicity of review cycle	Potential detail further review
				On hand	Can be developed	Identification	Title	Source		

The Canadian Institute of Chartered Accountants

The Canadian Institute of Chartered Accountants
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June 1983

The Canadian Institute of Chartered Accountants (CICA), together with the institutes in every province and the territories, is the professional association of Canada's over 36,000 chartered accountants. The profession is responsible for developing accounting and auditing standards used by Canadian business, and has initiated the development of accounting and auditing statements for use in the public sector. The CICA is a leading member of organizations developing international standards. The Institute also undertakes extensive education and publishing programs.

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